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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/734,803	12/12/2003	Joseph Carmine Centanni	Centanni 2-32-9-22-5-7 (L	3519

46363 7590 09/18/2007

PATTERSON & SHERIDAN, LLP/
LUCENT TECHNOLOGIES, INC
595 SHREWSBURY AVENUE
SHREWSBURY, NJ 07702

EXAMINER	
CURS, NATHAN M	

ART UNIT	PAPER NUMBER
2613	

MAIL DATE	DELIVERY MODE
09/18/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/734,803	CENTANNI ET AL.	
	Examiner	Art Unit	
	Nathan Curs	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 June 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,8-11 and 14-23* is/are rejected.

7)☒ Claim(s) *3,5-7,12 and 13* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1, 2, 4, 9-11, 14 and 16-21 are rejected under 35 U.S.C. 102(e) as being anticipated by Chou et al. ("Chou") (US Patent Application Publication No. 2005/0280886).

Regarding claim 1, Chou discloses an optical switch (paragraph 0015), comprising: a first optical combiner for combining at least two optical pump signals to produce a combined pump signal, and a second optical combiner for combining an input data signal with the combined pump signal to produce a combined signal (fig. 4 and paragraphs 0068-0071); a non-linear optical element for imparting a non-linear effect on the combined signal (paragraphs 0023, 0024 and 0044); at least one optical splitter for separating the combined signal from said non-linear optical element into respective generated optical bands (fig. 7 and paragraphs 0091 and 0092); wherein at least one of said at least two optical pump signals is controllably modulated such that a logic sequence of said input data signal is controllably switched (fig. 4, elements 96 and 98 and paragraph 0070).

Regarding claim 2, Chou discloses the optical switch of claim 1, further comprising at least two optical pump sources, each of said sources providing one of said at least two optical pump signals (fig. 4), wherein at least one of said at least two optical pump sources is adapted

to controllably modulate its respective optical signal such that a logic sequence of said input data signal is controllably switched and an output signal of said optical switch comprises a multi-band switched optical signal (fig. 4 and paragraphs 0070 and 0091).

Regarding claim 4, Chou discloses the optical switch of claim 2, further comprising a controller for controlling the modulation of the at least one modulated optical pump source (paragraph 0070, where controlling the presence or absence of each pump beam in the mixer requires an inherent pump modulation controller).

Regarding claim 9, Chou discloses the optical switch of claim 1, wherein said non-linear optical element generates a parametric amplification of the combined signals (paragraph 0023).

Regarding claim 10, Chou discloses the optical switch of claim 9, wherein said non-linear effect comprises difference frequency generation (paragraph 0023).

Regarding claim 11, Chou discloses the optical switch of claim 9, wherein an output of said optical switch comprises a replica of said input data signal and at least three idler signals (fig. 7 and paragraphs 0091 and 0092).

Regarding claim 14, Chou discloses the optical switch of claim 9, wherein each wavelength of said input data signal is converted into a corresponding wavelength in said respective generated optical bands (fig. 4 and paragraph 0070).

Regarding claim 16, Chou discloses the optical switch of claim 1, wherein said at least one optical combiner comprises a band splitter (fig. 7 and paragraph 0091, where a wavelength directional coupler reads on a band splitter).

Regarding claim 17, Chou discloses the optical switch of claim 1, wherein said at least one optical splitter comprises a band splitter (fig. 7 and paragraph 0091, where a wavelength directional coupler reads on a band splitter).

Regarding claim 18, Chou discloses a method of optical switching (paragraph 0015) using a fiber parametric device having at least two optical pump sources (fig. 4 and paragraph 0070), comprising: combining a signal from each of said at least two optical pump sources in a first combiner to produce a combined pump signal, and combining the combined pump signal with an input data signal to produce a combined signal (fig. 4 and paragraphs 0068-0071); imparting a non-linear effect on the combined signal (paragraphs 0023, 0024 and 0044); and controllably modulating at least one of said at least two optical pump sources such that a logic sequence of said input data signal is controllably switched (fig. 4, elements 96 and 98 and paragraph 0070).

Regarding claim 19, Chou discloses the method of claim 18, further comprising separating said combined signal into respective generated optical bands (fig. 7 and paragraphs 0091 and 0092).

Regarding claim 20, Chou discloses the method of claim 19, wherein said non-linear effect generates a parametric amplification of said combined signal such that an output of said fiber parametric device comprises a multi-band switched optical signal (paragraph 0023, and fig. 4 and paragraph 0070).

Regarding claim 21, Chou discloses the method of claim 20, wherein the output of said fiber parametric device comprises at least a replica of said input data signal and three distinct idler bands (fig. 7 and paragraphs 0091 and 0092).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chou (US Patent Application Publication No. 2005/0280886) in view of Farries et al. ("Farries") (US Patent No. 5127928).

Regarding claim 8, Chou discloses the optical switch of claim 1, and discloses that a variety of nonlinear optical materials can be used for the optical mixer (paragraph 0023), but does not discloses that said non-linear optical element comprises a highly non-linear fiber. Farries discloses optical mixing using second-order nonlinear fiber (col. 3, lines 28-68). It would have been obvious to one of ordinary skill in the art at the time of the invention to use second-order nonlinear fiber as an engineering design choice in implementing the second-order nonlinear optical material already disclosed by Chou. The type of nonlinear optical material claimed merely amounts to the selection of expedients known as design choices to one of ordinary skill in the art.

5. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chou (US Patent Application Publication No. 2005/0280886).

Regarding claim 15, Chou discloses the optical switch of claim 2, but does not explicitly disclose that said optical pump sources comprise laser sources. However, the office takes office notice that optical pump light used to pump nonlinear optical materials is conventionally created using pump lasers. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use pump lasers to create the pump light of Chou, to provide the benefit of providing the pump light at the specific wavelengths needed for the nonlinear processes.

6. Claims 1, 2, 4, 8, 15, 17-19, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeda et al. ("Takeda") (US Patent No. 6424774) in view of Bjarklev et al. ("Bjarklev") (US Patent Application Publication No. 2004/0100681) and further in view of Cearns et al. ("Cearns") (US Patent No. 5943149).

Regarding claim 1, Takeda discloses an optical switch, comprising: a first optical combiner for combining an input data signal with two pump signals, alternatively with each pump signal, to produce a combined signal (fig. 3, elements 22, 24, 25 and 27 and col. 4, line 31 to col. 5, line 29), a non-linear optical element for imparting a non-linear effect on the combined signal (fig. 3, elements 21 and col. 4, line 31 to col. 5, line 29); and at least one optical splitter for separating the combined signal from said non-linear optical element into optical bands (fig. 3, element 23 and col. 5, lines 6-22, where the BPF splits both λ_{c1} and λ_{c2} from the combined signal); wherein at least one of said at least two optical pump signals is controllably modulated such that a logic sequence of said input data signal is controllably switched (fig. 3, element 27 and col. 5, lines 6-22). Takeda does not disclose combining two pumps into a first combined signal and then combining the first combined signal with the data signal. Takeda discloses two pumps signals, but only one pump signal at a time is combined with the data signal. Bjarkley discloses using two pumps signals together in a four-wave mixer (paragraph 0002). It would have been obvious to one of ordinary skill in the art at the time of the invention to add an additional pump signal in Takeda, combining it with each alternating pump signal by coupling the additional pump signal to the output of the selector, to provide the benefit of ensuring polarization insensitive operation, as taught by Bjarkley. Takeda discloses that the BPF splits out the two converted data signals from the combined signal, but does not disclose that that splitter splits out the pump wavelength as well. Cearns discloses an optical BPF that passes the filter wavelengths through and reflects the unfiltered wavelengths (fig. 4

and col. 5, lines 23-50). One of ordinary skill in the art at the time of the invention could have used a BPF like that of Cearns for the BPF of the combination and the results of the substitution would have been predictable; namely, the pump signal would be reflected instead of blocked.

Regarding claim 2, the combination of Takeda, Bjarkley and Cearns discloses the optical switch of claim 1, further comprising at least two optical pump sources, each of said sources providing one of said at least two optical pump signals, wherein at least one of said at least two optical pump sources is adapted to controllably modulate its respective optical signal such that a logic sequence of said input data signal is controllably switched and an output signal of said optical switch comprises a multi-band switched optical signal (Takeda: fig. 3 and col. 4, line 31 to col. 5, line 29)

Regarding claim 4, the combination of Takeda, Bjarkley and Cearns discloses the optical switch of claim 2, further comprising a controller for controlling the modulation of the at least one modulated optical pump source (Takeda: fig. 3, where the control signal indicates a controller).

Regarding claim 8, the combination of Takeda, Bjarkley and Cearns discloses the optical switch of claim 1, wherein said non-linear optical element comprises a highly non-linear fiber (Takeda: col. 2, lines 62-65).

Regarding claim 15, the combination of Takeda, Bjarkley and Cearns discloses the optical switch of claim 2, wherein said optical pump sources comprise laser sources (Takeda: fig. 3, elements 22).

Regarding claim 17, the combination of Takeda, Bjarkley and Cearns discloses the optical switch of claim 1, wherein said at least one optical splitter comprises a band splitter (Takeda: fig. 3, element 23 and Cearns: fig. 4 and col. 5, lines 23-50, as applicable in the combination).

Regarding claim 18, Takeda discloses a method of optical switching using a fiber parametric device having at least two optical pump sources, comprising: combining an input data signal with two pump signals, alternatively with each pump signal, to produce a combined signal (fig. 3, elements 22, 24, 25 and 27 and col. 4, line 31 to col. 5, line 29), imparting a non-linear effect on the combined signal (fig. 3, elements 21 and col. 4, line 31 to col. 5, line 29); and controllably modulating at least one of said at least two pump sources such that a logic sequence of said input data signal is controllably switched (fig. 3, element 27 and col. 5, lines 6-22). Takeda discloses two pumps signals, but only one pump signal at a time is combined with the data signal, but Takeda does not disclose combining two pumps into a first combined signal and then combining the first combined signal with the data signal. And Takeda discloses that the BPF splits out the two converted data signals from the combined signal, but does not disclose that that splitter splits out the pump wavelength as well. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Bjarkley and Cearns with Take as described above for claim 1.

Regarding claim 19, the combination of Takeda, Bjarkley and Cearns discloses the method of claim 18, further comprising separating said combined signal into respective generated optical bands (Takeda: fig. 3, element 23 and col. 5, lines 6-22, where the BPF splits both λ_{c1} and λ_{c2} from the combined signal).

Regarding claim 22, the combination of Takeda, Bjarkley and Cearns discloses the optical switch of claim 1, wherein the non-linear optical element generates a number of optical bands based on a simultaneous three-signal interaction of the two optical pump signals and the input data signal (Takeda: fig. 3 and Bjarkley: paragraph 0002, as applicable in the combination).

Regarding claim 23, the combination of Takeda, Bjarkley and Cearns discloses the method of claim 18, wherein the non-linear effect generates a number of optical bands based on a simultaneous three-signal interaction of the two optical pump signals and the input data signal (Takeda: fig. 3 and Bjarkley: paragraph 0002, as applicable in the combination).

Allowable Subject Matter

7. Claims 3, 5-7, 12 and 13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

8. Applicant's arguments filed 26 June 2007 have been fully considered but they are not persuasive. The applicant argues that Chou doesn't teach a first combiner for combining at least two pump signals, or a second optical combiner for combining an input data signal with the combined pump signal. However, the mixer shown in Chou fig. 7 is applicable to the frequency generation of Chou fig. 4, and fig. 7 shows plural pumps signal arriving to the mixer on one line and the data signals arriving on another line. For the plural pump signals to arrive on the same line to the mixer they had to have been previously combined somehow. The combined pump signals and the data signals are then combined in the mixer. This arrangement reads on the claimed combining of pumps signals then of the data signal.

Conclusion

9. Any inquiry concerning this communication from the examiner should be directed to N. Curs whose telephone number is (571) 272-3028. The examiner can normally be reached on M-F (from 9 AM to 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan, can be reached at (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (800) 786-9199.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pairdirect.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JASON CHAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600